## REMARKS

Entry of the foregoing amendments is respectfully requested.

## Summary of Amendments

Upon entry of the present amendments, independent claims 70, 84, 101, 119, 132 and 135 are amended and claims 140-143 are added, whereby claims 70-99, 101-117 and 119-143 will be pending.

Support for the amended and new claims can be found throughout the present specification and in particular, paragraphs [0002], [0003] and [0060] thereof. The amendments to claims 70, 84, 101, 119, 132 and 135 have been made in particular in view of the remarks at page 2 and page 6, second paragraph, of the present Office Action.

Applicants emphasize that the amendments to claims 70, 84, 101, 119, 132 and 135 are without prejudice or disclaimer, and Applicants expressly reserve the right to prosecute the amended claims in their original, unamended form in one or more divisional and/or continuation applications.

## Summary of Office Action

As an initial matter, Applicants note that the present Office Action is in response to Applicants' Appeal Brief under 37 C.F.R. § 41.37 filed May 1, 2007, wherefore it is assumed that examination has been reopened and the appeal is no longer pending. Should this assumption not be correct, Applicants respectfully request a notification to this effect as soon as possible.

Applicants note that the rejections in the Final Office Action mailed October 24, 2006 are either withdrawn or presented as rejected under fewer statutes.

Claims 71-83, 101-116, 119-130 and 135-139 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for allegedly failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention.

Claims 70-83 and 132-134 are rejected under 35 U.S.C. § 102(e) as allegedly being anticipated by Finkelshtain et al., US 2002/0083640 A1 (hereafter "FINKELSHTAIN").

Claims 70-97, 99, 101-116, 119-130 and 132-139 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Tsang, U.S. Patent No. 6,818,334 B2 (hereafter "TSANG ") in view of Amendola et al., US 2002/0083643 A1 (hereafter "AMENDOLA").

## Response to Office Action

Reconsideration and withdrawal of the rejections of record are respectfully requested in view of the foregoing amendments and the following remarks.

### *Response to Rejection of Claims 71-83, 101-116, 119-130 and 135-139 under 35 U.S.C. § 112, Second Paragraph*

Claims 71-83, 101-116, 119-130 and 135-139 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for allegedly failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Specifically, the rejection asserts that in claims 71-83 (probably claims 70-83 was intended) and 101-116 it is not clear if or how solvent (b) differs from solvent (a) and with respect to claims 119-130 and 135-139 it is asserted

that the language "if the solvent in the at least one second container" or "compartment and the concentrate in the first compartment combined" allegedly is not positive claim language.

Applicants respectfully disagree with the Examiner in this regard (although the rejection with respect to claims 119-130 and 135-139 is not even completely clear to Applicants) but nevertheless have amended the independent claims in a way which is believed to render the present rejections under 35 U.S.C. § 112, second paragraph, moot.

***Response to Rejection under 35 U.S.C. § 102(e) [102(b)]***

Claims 70-83 and 132-134 are rejected under 35 U.S.C. § 102(e) as allegedly being anticipated by FINKELSHTAIN. The rejection alleges that FINKELSHTAIN teaches a fuel composition for fuel cells comprising a primary fuel and an auxiliary fuel including at least one hydrogen-containing inorganic compound with a high reduction potential. The rejection further asserts that the hydrogen containing inorganic compound allegedly is KOH and is present in the fuel composition such that the OH concentration is between 2 and 12 M and that the auxiliary fuel component is a metal hydride, whereby FINKELSHTAIN allegedly (explicitly or inherently) teaches "all of the limitations" of the rejected claims.

Applicants respectfully traverse this rejection. As an initial matter and in order to make the official record as clear as possible, it is noted that FINKELSHTAIN was published on July 4, 2002, i.e., more than one year before the filing date of the present application (January 16, 2004), thereby meeting the formal requirements of 35 U.S.C. § 102(<u>b</u>).

Applicants further note that claims 70-83 and 132-134 are <u>process</u> claims. These process claims recite, *inter alia*, not only a composition of a fuel concentrate but also a <u>dilution</u> thereof

with a solvent (or combining the concentrate with a solvent, respectively). Accordingly, even if one were to assume, *arguendo*, that FINKELSHTAIN discloses a fuel composition which is encompassed by the fuel concentrate recited in the rejected claims (as the Examiner appears to assume), it is not seen that FINKELSHTAIN discloses the <u>dilution</u> of a corresponding composition with a solvent (diluent), and neither has the Examiner pointed to any passage of FINKELSHTAIN where such a dilution is allegedly disclosed.

It is noted that at page 5, last full paragraph, the present Office Action states (emphasis added): "Finkelshtain clearly teaches that the Molarity of the KOH may be as high as 12. This is clearly the <u>motivation</u> one would need to increase the KOH concentration". In this regard, Applicants respectfully submit that there is no room for arguing an alleged "motivation" in the context of a rejection under 35 U.S.C. § 102.

For at least all of the foregoing reasons, FINKELSHTAIN fails to anticipate the subject matter of any of the claims submitted herewith. Accordingly, the rejection of claims 70-83 and 132-134 under 35 U.S.C. § 102(e) (or 102(b), respectively) over FINKELSHTAIN is unwarranted and should be withdrawn, which action is respectfully requested.

***Response to Rejection under 35 U.S.C. § 103(a)***

Claims 70-97, 99, 101-116, 119-130 and 132-139, i.e., all claims under consideration, are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over TSANG in view of AMENDOLA. The rejection alleges that TSANG "discloses production of two solutions, one comprising metal borohydride, water and hydroxide, the other comprising water, which are then combined thus diluting each and which then forms a mixture used as a fuel in a fuel cell (column

1, lines 42 to column 2, line 34, column 3, line 54 to column 4, line 45)". The rejection concedes that TSANG does not specifically teach the claimed proportions and does not suggest the pH recited in the present claims. In this regard, the rejection relies on paragraphs [0033] and [0032] of AMENDOLA which allegedly suggest that a higher pH is more effective and allegedly suggest starting with a concentrated solution and adding water during use. Regarding the claimed package or container, the rejection alleges that it would have been obvious to one or ordinary skill in the art "to package or container the obvious storage stable concentrate along with a package or container containing the necessary solvent for obtaining the optimal fuel mixture and appropriate instructions because: (1) such avoids problems of dosing the proper amounts of the two components by the end user; (2) such avoids problems of dosing with impure solvent."

Applicants respectfully traverse this rejection as well. Specifically, it is again pointed out that TSANG and AMENDOLA have in common that they relate to the use of a borohydride solution as a <u>hydrogen source for a fuel cell based on hydrogen</u>, i.e., <u>not</u> to the use of a borohydride solution (or any other metal hydride solution) which serves at the actual fuel (i.e., <u>without</u> prior conversion to hydrogen) for a liquid fuel cell.

In other words, unlike the diluted metal hydride concentrate of the present claims, the borohydride solutions of TSANG are not intended to be used <u>as such</u> to operate a fuel cell, but are used only <u>indirectly</u> in that after addition thereto of a (metal) catalyst which catalyzes the decomposition reaction of the borohydride according to the equation shown in, e.g., col. 2, line 58 of TSANG to generate hydrogen gas, the hydrogen gas is <u>transferred</u> to a fuel cell where the hydrogen gas is used as the actual fuel.

The same applies to the solutions of AMENDOLA. According to its abstract, AMENDOLA relates to the use of borohydride based solutions as a hydrogen storage source and a catalyst system to release hydrogen therefrom. An equation similar to that in col. 2 of TSANG is shown in paragraph [0028] of AMENDOLA.

Further, it is again emphasized that the complete paragraph [0032] of AMENDOLA on which the Examiner relies states (emphases added):

> Since two water molecules are consumed for each borohydride molecule according to reaction (1), the concentration of all the remaining components (the cation, the borate, and the borohydride) will increase as the reaction continues. Therefore, twice as many water molecules as borohydride molecules are needed to sustain a constant rate of reaction. This excess water can be provided to the reaction in two ways: (i) charging the initial metal hydride solution with excess water, i.e., starting with a dilute solution, or (ii) adding more water from a separate source during or after the reaction. The second alternative is preferred to minimize the initial starting weight of water plus borohydride. Adding water from a separate source during or after the reaction is viable because the main byproduct of hydrogen oxidation in a hydrogen-consuming device is water. A hydrogen-consuming device, as used herein, means a device that uses hydrogen as a fuel, e.g., a fuel cell, combustion engine, or a gas turbine. Thus, water generated from the hydrogen-consuming device can be added to the borohydride solution. Assuming that water is recycled from the fuel cell or engine, 8 weight units of hydrogen (4 from water and 4 from borohydride) can come from 22 weight units of lithium borohydride. The resulting theoretical hydrogen conversion ratio is 36.36% by weight of hydrogen per unit of borohydride (8.div.22.times.100). Therefore, the hydrogen generation system can include a slurry tank to store the borohydride and an adjacent mixing tank to add additional water obtained from the exhaust of the hydrogen consuming device, thereby allowing complete reaction of the borohydride while preventing the borohydride solution from drying out, i.e., preventing the components of the borohydride solution from precipitating out of solution.

Particularly the above underlined passages of paragraph [0032] of AMENDOLA make it clear that AMENDOLA neither teaches nor suggests providing a borohydride containing concentrate and diluting the concentrate with a polar solvent to prepare the final fuel for a (direct liquid) fuel cell, let alone providing a packaged combination of the concentrate and the solvent.

In fact, according to AMENDOLA the solvent (water) for the dilution of the water-depleted borohydride solution is not even present at the beginning, but is <u>continuously generated</u> by the oxidation of the hydrogen gas inside, e.g., a fuel cell and is then recycled to the borohydride solution from which a part of the hydrogen of the water originated (the other part originates from the borohydride).

The disclosure in paragraph [0033] of AMENDOLA, also relied on by the Examiner, does not add anything to the disclosure of TSANG, either. A 40 % alkali hydroxide or alkaline metal hydroxide solution as mentioned in claim 1 of TSANG can safely be assumed to have a pH of greater than 14, i.e., the most preferred pH according to paragraph [0033] of AMENDOLA.

Applicants further point out again that the indication of the intended use of the diluted fuel concentrate recited in the present independent claims, i.e., as fuel for a direct liquid fuel cell, implies certain characteristics of the fuel and the fuel concentrate, respectively which are not necessarily present in a fuel (concentrate) which is used merely for the generation of hydrogen (as is the case with the "fuels" of TSANG and AMENDOLA). For example, it is apparent that a fuel that is to be used directly (as such) in a fuel cell (i.e., without first generating hydrogen therefrom) must not contain impurities which would cause significant harm to the (interior of the) fuel cell and/or the feeding device for the fuel possibly associated therewith (e.g., corrosion) and/or would poison the oxidation catalyst of the anode of the liquid fuel cell (which catalyst is to catalyze, e.g., the reaction depicted in paragraph [0004] of the present specification and is to prevent, e.g., the reaction depicted in paragraph [0005] of the present specification (generation of hydrogen gas) to as high a degree as possible).

In contrast, a fuel that is used merely for the generation of hydrogen by catalytic decomposition of a metal hydride may contain impurities which would not usually be acceptable if the fuel were to be used directly inside the fuel cell (because essentially only the hydrogen gas will eventually reach the inside of the fuel cell). In fact, it would appear that the only impurities in a metal hydride solution for the generation of hydrogen which could cause a potential problem are substances which can inactivate the catalyst that is to catalyze the decomposition of the metal hydride.

Also, a fuel for use as a hydrogen generator may often have a much higher concentration of the components thereof than a fuel that is to be supplied directly to a fuel cell and must be used therein as such. In other words, a high viscosity of the fuel is much more acceptable when the fuel is to be used for the generation of hydrogen gas instead of as the actual fuel that is to be oxidized at the anode of a fuel cell.

Further, it is pointed out again that present independent claim 132 is drawn to a method of reducing the decomposition of a fuel for a direct liquid fuel cell during storage of the fuel. Neither TSANG nor AMENDOLA are directed to corresponding subject matter, which is yet another reason why these documents are unable to render obvious the subject matter of present claims 132 and the claims dependent therefrom.

With respect to independent claims 84, 101, 119 and 135 (and the claims dependent therefrom), Applicants respectfully submit that the disclosure of TSANG (and also that of AMENDOLA) fails to motivate one of ordinary skill in the art to (pre)package Solution A and Solution B described therein in the way recited in present independent claims. In this regard, it is noted that in the passage from col. 4, line 35 to col. 5, line 11, TSANG states (emphases added):

The best mode to practice the embodiments disclosed herein is to meter the $NaBH_4$ solution (Solution A) and the second aqueous solution (Solution B) independently by two separate mechanical devices, i.e., pumps, into a chamber that contains the catalyst. ... To further accelerate the reaction rate, the reaction chamber may also be heated externally by a capacitor or other electronic device.

FIG. 1 depicts schematically a PEM fuel cell 10 employing the teachings herein. ...

Oxygen and/or air is introduced to the cathode 12, while hydrogen gas is introduced to the anode 14. Hydrogen gas is generated in a reaction chamber 20, using a catalyst (not shown). In the reaction chamber, aqueous sodium borohydride, exposed to the catalyst, generates hydrogen gas and sodium borate, as described above. Hydrogen from the reaction chamber 20 is then introduced into the PEM fuel cell 10.

In accordance with the teachings herein, Solution A, comprising sodium borohydride in water, and Solution B, comprising water, and the optional water-soluble additive, are combined in the reaction chamber 20. Solution A is contained in reservoir 22, while Solution B is contained in reservoir 24. A metering pump/valve 26 meters out the desired volume of Solution A into the reaction chamber 20, while metering pump/valve 28 meters out the desired volume of Solution B into the reaction chamber. Thus, Solutions A and B are metered separately from separate reservoirs 22, 24 and mixed within the reaction chamber 20.

In another embodiment, the reaction chamber is heated, using an external heating mechanism 30, to increase the reaction rate of the Solutions A and B in the presence of the catalyst. The temperature to which the reaction chamber is heated is advantageously less than the boiling points of the two solutions.

The above statements apparently refer to an operation on an industrial scale where the use of containers like those recited in the rejected claims (and also those recited in new claims 140-143) would not make sense already for the reason that due to the large volumes of solutions A and B involved, corresponding (prepackaged) containers would have to be large and thus, difficult and burdensome to transport.

Further, if one were to assume that the process described in TSANG is operated on a scale which would make the use of (prepackaged) containers like those recited in the rejected claims feasible, it is not seen that this would be an economical process. The containers and thus, the amount of hydrogen that can be generated from the contents of these containers would be

much too small and would not be suitable even for the batchwise operation of complex equipment that apparently is needed to transfer the generated hydrogen (i.e., a highly flammable gas) from the reaction chamber to the fuel cell.

In view of the foregoing, it is submitted that TSANG in view of AMENDOLA is unable to render obvious the subject matter of any of the claims submitted herewith. Accordingly, withdrawal of the rejection of claims 70-97, 99, 101-116, 119-130 and 132-139 under 35 U.S.C. § 103(a) over TSANG in view of AMENDOLA is warranted and respectfully requested.

## CONCLUSION

In view of the foregoing, it is submitted that all of the claims in this application are in condition for allowance, which action is respectfully requested. If any issues yet remain which can be resolved by a telephone conference, the Examiner is respectfully invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,
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September 11, 2007
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